

Antonio Stradivari, Guitar Maker

by Jan van Cappelle

THE NAME “STRADIVARIUS” has an almost magical ring to it. Like Shakespeare and DaVinci, it has become an archetype shrouded in mystery, discussed and celebrated with almost religious fanaticism.

Most of the public attention focuses on the fabulous, highly appraised and prized violins and their world-famous players. That their maker also made other instruments like the viola da gamba, pochette, mandolin, viola d’amore, lute, guitar, and even a small harp, remains a mere footnote, although in recent years there has been an increase of interest in this field, as publications by Gianpaolo Gregori,¹ Stewart Pollens,² and Sinier de Ridder³ show. Despite their wonderful work, I would like to offer a slightly more hands-on approach, trying to rediscover the way Stradivari designed and made guitars and come to a more authentic reconstruction. I hope it will help you in your own work, even if you completely disagree with me.

Only five guitars by Stradivari are believed to survive:

The Sabionari	1679	Private Collection	Milan, Italy
The Giustiniani	1681	Private Collection	Milan, Italy
The Hill	1688	Ashmolean Museum	Oxford, UK
The Rawlings	1700	National Music Museum	Vermillion, U.S.A.
The Vuillaume	1711?	Cité de la Musique	Paris, France

There is also a guitar neck, dated 1675, now kept in the Museo Stradivariano in Cremona. And a sixth guitar, the Canobio-Pagliari, by another maker (probably of German-Venetian descent) bearing the label “*Revisto e coretto da me Antonio Stradivari in Cremona l’anno 1681*” (Revisited and corrected by me, Antonio Stradivari in Cremona in the year 1681).⁴ Besides these instruments, a number of guitar-making forms and templates used by the great master are kept in the Cité de la Musique in Paris and the Museo Stradivariano in Cremona.

The guitars share some distinctive characteristics.

Compared to other guitars of their time they look rather plain and sober. Decorations are kept to a minimum and the materials used are quite modest. Unfortunately, no other guitars from 17th-century Cremona survive, but archival sources tell that the Amati and Guarneri workshops also made guitars.⁵

Of the five extant guitars, the Hill is probably the most famous. Numerous copies have been made, based on the plans drawn by Stephen Barber in 1979. More recently a set of plans

of the Rawlings drawn by Jonathan Santa Maria Bouquet was published. These plans are available through the museums that store the guitars.

Making historic musical instruments always requires us to question everything. All of the surviving guitars have been modified and/or show nonoriginal elements. Over the centuries necks have been shortened or even replaced, metal frets installed, pegheads redrilled, barring altered, bridges replaced, and rosettes and moustaches removed. This may have been either to keep up with changing musical fashions or due to inexpertly executed restorations. It is up to us to study the remains and find out what is original. See **Table 1**.

Recently the Sabionari was restored and brought back to playing condition.⁶ The original string length was restored by replacing the apocryphal neck and bridge. You can find some sound samples on the website (www.sabionari.com) and YouTube.

Only the 1688 Hill guitar is considered to have its original neck and string length unaltered. The 741mm scale is long, even for Baroque standards. It causes difficult playing and problems with breaking gut strings when tuned to *e'*. For comparison, guitars by Joachim Tielke (Hamburg, 1641–1719) range from 610mm to 715mm.⁷ Guitars by the French Voboam family (Paris, 1641–1730) vary from 614mm to 711mm, although there is an instrument by Jean Voboam, dated 1681, with a 760mm string length, but this is considered to be an exception.⁸

Over the years I have discussed this phenomenon with many players, researchers, violin makers, and guitar makers. Their general opinion was that Stradivarius was mainly a violin maker who hadn’t much interest in making guitars. Or maybe he just didn’t know better than to make guitars with a scale that was too long. This always struck me as a rather simplistic, weak, and unsatisfying explanation. I am an instrument maker myself, and I want everything I make to be as good as possible, regardless of its nature. But I realize this is a modern projection. Another reason I find this given explanation hard to believe is the time span of roughly thirty years between the first and last known guitar. If he really didn’t know better, wasn’t there any player in 17th-century Cremona who gave some feedback? Like: “Hey Tony, nice guitar, but the strings are somewhat too long for me.” And Tony answered that it didn’t bother him, because he was a violin maker?

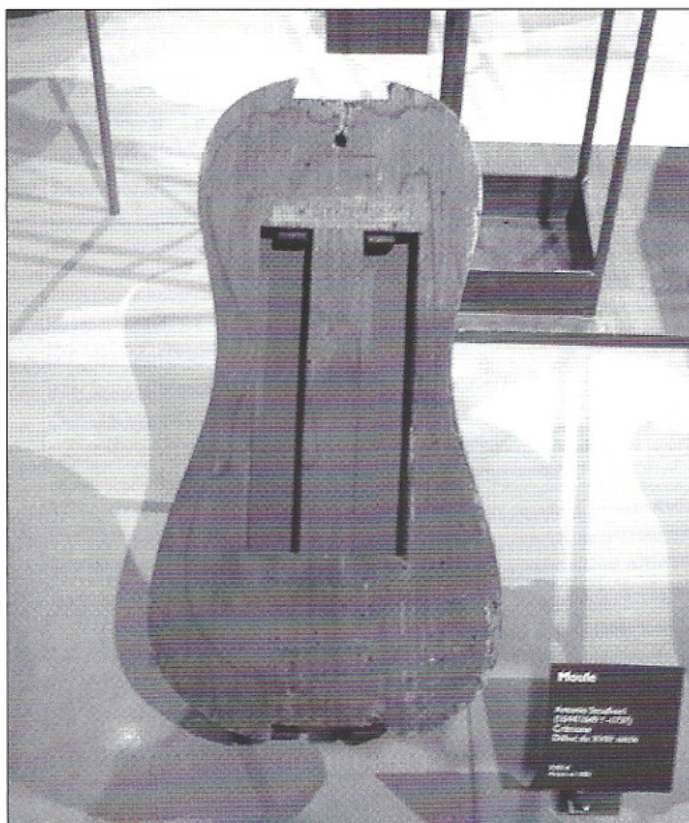
	Year	Neck shortened	Neck replaced	Metal frets installed	Peghead redrilled	Bridge replaced	Barring altered	Rosette removed	Moustaches removed	Bars added to the back	Outline changed	Provenance debated
“Sabionari”	1679		•			•	•	•	•	•		
“Giustiniani”	1681	•		•	•	•		•				
“Hill”	1688	?		•		?	?		•			
“Rawlings”	1700		•	•	?	?	•	?	•	•	?	
“Vuillaume”	1711?					•	?		•			•

Table 1. Modifications to Stradivari’s guitars.

Several modern makers tackled this problem like some “restorers” did to the originals; simply shortening the neck by $\pm 9\text{cm}$. At first sight this might seem reasonable, but consider what would happen if I took a viola and cut the neck down in order to play it like a violin? How would it sound? Imagine the reactions of so-called purists!

Instead of trying to “correct” the existing guitars, let’s ask why the strings were so long in the first place. These guitars clearly served a function in their time, otherwise they wouldn’t have been made. Were they perhaps bass instruments, tuned lower than the now usual *e*? This hypothesis is brought up by Stewart Pollens in his book *Stradivari*.⁹ When we simply use a string calculator¹⁰ to determine the highest usable pitch for a plain gut string at 741mm it gives a *d*’ at 415Hz or *d*’ at 440Hz, translating to a 0.44mm string at 35N tension.

This brings up the next question: Were there different sizes of guitars in use during Stradivari’s time? Pollens brings up written sources, one by Giovanni Foscarini (1640) and another by Carlo Calvi (1646) that point to guitars in different sizes with various tunings.¹¹ Historical guitars that illustrate this custom are the 1581 Belchior Dias¹² (Lisbon, 553mm), 1646 Giovanni Smit¹² (Milan, approx. 510mm, 4-course), 1699 Joachim Tielke¹⁴ (Hamburg, 478mm) and the very unusual double guitar by Alexandre “LeJeune” Voboam¹⁵ (Paris, 1690, 711mm and 441mm). We must also take in consideration that most instruments (violin, viola da gamba, baryton, viola d’amore, mandolin, cittern, vihuela, lute, harpsichord, various flutes and other wind instruments) were made and played in various sizes. Some of these families of instruments remain in use until this day.



Another question: Did the Stradivari workshop only make these five extant guitars? Let’s look at another source of information left by Stradivari: A lot of his workshop materials have survived to the present day. After Stradivari’s death his violin-making sons Francesco and Omobono inherited the tools and workshop, but they both died shortly after their father. In 1775, their youngest brother Paolo sold the workshop materials to Count Cozio di Salabue, a violin collector. Due to various circumstances, the materials were split up and found their way to the museums of Paris and Cremona.

A substantial part of these wooden and paper forms, patterns, and templates were intended for the production of guitars. The first clues are five templates with ten different headstock profiles in various sizes, kept in the Museo Stradivariano in Cremona (MS. nos. 376–381). One of these templates (MS. no. 308/ds) reportedly matches the headstocks of the Giustiniani, Hill, and Vuillaume guitars.¹⁶ But the Rawlings doesn’t match any of these profiles.

Sacconi describes a paper pattern for a guitar and neck (MS. no. 374) with an even longer string length (770mm) than the Hill example, and two patterns for the neck of a “Chitarra Tiorbata” (MS. no. 375: 385).¹⁷

Additionally Gregori mentions one wooden moustache (MS. no. 900), three models for those (MS. no. 901–903) and three paper patterns for guitar tops (MS. no. 719, 721, 750). The provenance of these three models is uncertain,¹⁸ but MS. no. 721 reportedly pays close resemblance to the Vuillaume guitar.¹⁹

Besides the Vuillaume guitar, the Cité de la Musique in Paris also houses six wooden forms ascribed to Stradivari. Three of these (MM. E.901.4, E.901.5, E.901.6) were probably used to make guitars. These forms were bought in 1880 at an auction of the possessions of the late J.B. Vuillaume, who probably acquired them from the heirs of the Italian collector Luigi Tarisio.²⁰ One of these three cornerless forms



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Top right: Paris form MM. E.901.5 in the museum.

Above: The author’s forms at the workbench. The large form is based on MS. no. 374, the small one on MM. E.901.6, and the one in the foreground on MS. no. 750.

(MM. E.901.4) has later been cut down to serve as a form for a viola d'amore.²¹ In a way, this is both a curse and a blessing: the original guitar shape was lost, but the new profile reportedly matches a paper pattern kept in Cremona (MS. no. 368) and proves almost certainly that the form comes from Stradivari's workshop.²² Rather than trying to "correct" the existing guitars, I'd like to use these forms and patterns as a starting point for a reconstruction.

When I draw a plan of an existing guitar I try to "crack" the outline, that is, reconstruct the basic design using straight lines, compass arcs, and center points. In this process it is very helpful to know what unit of measurement the initial designer used. A Fender or Danelectro, for example, doesn't make sense in the metric system until you notice that 76.2MM equals 3". The unit of measurement is the key that unlocks the underlying form.

Here on the European continent, we are not familiar with the imperial system and its use of fractions. At school we only learn to use the metric system and its decimal way of measuring, calculation, and reasoning. In a way, this is a loss, but you don't notice until you learn how other systems work.

The metric system became widely used after the French Revolution and spread out over the European continent thanks to the Napoleonic Wars. Before this standardization, every place had its own local unit of measure. In *ancien régime* Paris the Voboam family used the "Pied du Roi" (Royal Foot) of 324.83MM.²³ The Ruckers family in Antwerp measured their harpsichord in "Voeten" (feet) that were divided in eleven "Duim" (thumb).²⁴ For a lute player from Rome it was hard to play together with a player from Venice, because the basic pitches were different between regions.²⁵

To "crack" Stradivari's instruments we therefore have to determine what unit of measure was used in 17th-century Cremona, and find out if he used it or not.

Most books about Stradivari give loads of dimensions of his instruments, but don't try to understand the underlying geometry and design. In his book *Geometry, Proportion, and the Art of Lutherie*, Kevin Coates gives an in-depth analysis of

many old instruments, but the "Brunswick Inch" (23.78MM)²⁶ doesn't match the design of these guitars. Robert Lundberg's "Venetian Inch" (27.4MM)²⁷ is very suitable for making lutes (the 1581 Georg Gerle for example²⁸), but again doesn't fit these guitars.

Stewart Pollens describes that in Stradivari's Cremona at least two standards were common: the "Braccio da Fabbrica" (483MM–484MM) and a second braccio used by the cloth merchants (595MM). The stone base of the clock tower in Cremona is inscribed with a crudely chiselled braccio da fabbrica of 484MM.²⁹ This was probably used as some sort of standardization for the city's trades.

Stradivari himself left a clue about the use of the use of the braccio da fabbrica on a paper pattern for the pillar of a harp (MS. no. 386) which reads: "Brasa duo — 2 lungo" (armlengths, two — 2 long). The overall height of the harp, including the carved cherub at the top is 966MM (2×483MM).³⁰

The braccio was divided in 12 *once* (1 *oncia* = 40.25MM), in their turn broken up in 12 *punti* (1 *punto* = 3.35MM). Pollens compares the dimensions of the "bowed" forms to the braccio da fabbrica system in a table and concludes that, "It is evident that the principal widths and lengths of the forms as well as the instrument made on them rarely fall on the whole, half, or quarter Cremonese Oncia. Thus, it would appear that Stradivari did not use the local unit of measure directly in the construction of his instruments."³¹

Knowing this, I decided to give the braccio da fabbrica a second try while re-engineering the design of Stradivari's guitars. The first piece of the puzzle fell into place with the length of the Hill headstock (161MM) which is precisely 4 *once*. The second piece found its spot with the Hill's string length (741MM = 18 *once* + 5 *punti*) and the Giustiniani's body length (473MM = 11 *once* + 9 *punti*). The body dimensions of the Sabionari, Gustiniani, and Hill are very similar and they were probably made on the same form.³² Another clue were the rectangular holes in Paris form MM. E.901.5 which measure 4⅔ *once* by ¾ *once* (4 *once* + 8 *punti* by 9 *punti*). See Table 2.

Pattern/ Form/ Guitar	Body length	Upper-bout width	Center-bout width	Lower-bout width	Rib height		Rose Ø	String length	Material	Suggested tuning
					Top	Bottom				
MS. no. 374**	12⅓	5¾	4⅝	7⅞	2½	3	2½	19½	paper	c#'
MS. no. 721**	12⅓	5½	4⅞	7			(2½)	(19½)	paper	c#'
"Giustiniani"/ "Sabionari"/ "Hill"	11¾	5¼	4⅓	6⅔	2⅓	2⅞	2	18½		d'
MS. no. 719	11½	4⅝	4	6⅓			1½	(17½)	paper	d#
"Rawlings"	10½	5¼	4¼	6⅔	1⅝	2⅞	1½	15½?		e'
MS. no. 750**	10¼	4¾	3½	5⅝			(1⅝)	(16⅓)	paper	e'
MM. E.901.4*	(10½)	(4½)	(3¾)	(5½)	1½	2	1½	(15)	wood	f'
MM. E.901.5*	9½	4⅞	3½	5¼	1½	2	1⅓	14½	wood	f'
MS. no. 369**	7¾	3⅓	2½	4				(12)	paper	a'
MM. E.901.6*	5½	2⅓	2½	3	1⅓	1½	1	8½	wood	e''

* For the "Paris" forms, I added ½ *punto* to the outline to resemble the sides of an instrument made on them.

** I consider the paper templates to be the size of finished instruments. This is loosely based on the matching viola d'amore templates (MS. no. 368 and MM. E.901.4).

Dimensions between brackets are my own reconstructions, based on proportional scaling of the existing instruments and inscriptions on the forms and patterns.

Table 2. Dimensions (in *once*) of Stradivari's patterns, forms, and guitars.

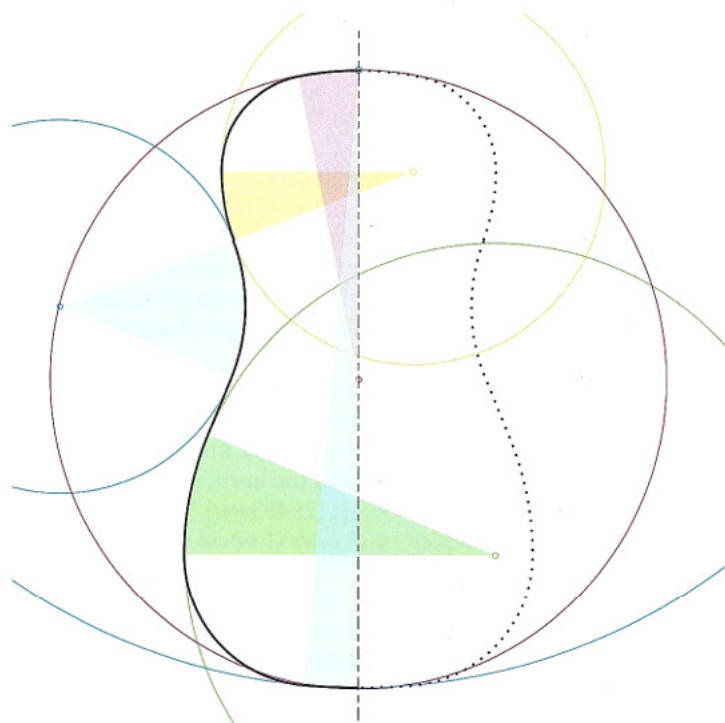


Figure 1. Construction with compass arcs.

I started by “cracking” the outlines of various forms and templates (MS. no. 374, MS. no. 750, MM. E.901.5, E.901.6) and the Sabionari guitar, by loading pictures of them into a CAD program and scaling them to their reported sizes. The first try to find some compass points was to draw a centerline and two circles; one with the radius of the full body length, the other with the diameter of that length. In most cases, this gave the first pieces of the outline at the top and bottom of the body. The “inward curves” of the center bout all seem to have their center points on the circle that encloses the whole body (Fig. 1). All of these circles have diameters that fall on the whole punto.

The “Parisian forms” all seem to be based on the same basic design structure. Form E.901.6 is roughly a scaled-down version of the other two forms. Knowing this, we can use the digital outline to make a reconstruction of the altered form, since the distance between the center of the soundhole and the bottom of the body was probably left intact (Fig. 2). The digital outlines also give the opportunity to compare the outlines by scaling and overlaying them (Figs. 3 and 4).

Pollens describes a 303mm long paper pattern for a cornerless body (MS. no. 369) which may have been used to make a form for a small guitar or a cornerless “violini piccoli,”³³ but it isn’t mentioned in the chapter about the guitars. Although at first sight it appears to be a visual match to the Rawlings guitar,³⁴ it clearly is not when compared to this, and neither does it fit to the rest of the guitars. It comes closer to the outline of a violin without corners, and was probably intended as a model for a bowed instrument.

Making a reconstruction of a Stradivari guitar means getting to grips with the tools and techniques of the 17th century. Fortunately, nothing has changed since then. Over the last decades, much investigation has been done about the way the Cremonese masters made their violins.³⁵ Besides the instruments, the surviving workshop materials have proved to be an invaluable source of information.³⁶ The construction method of the guitars was probably quite close to that of the violins he made, and when we look deeper into the matter we will even find an overlaps in techniques used.

I like to distinguish two basic construction methods that were used to make Baroque guitars. The first is the “in the air” or “archaic” manner. This is much like the way modern classical guitars are made, and was mostly used for flat-backed guitars. The soundboard was put down on a workboard (solera) and the neck was glued onto it. The sides were inserted into two slots in the neck, such that it also formed the upper block. Sometimes small wedges were used to lock the sides in place. At the bottom end of the body, the sides were glued to the tail block. The connection between soundboard and sides was

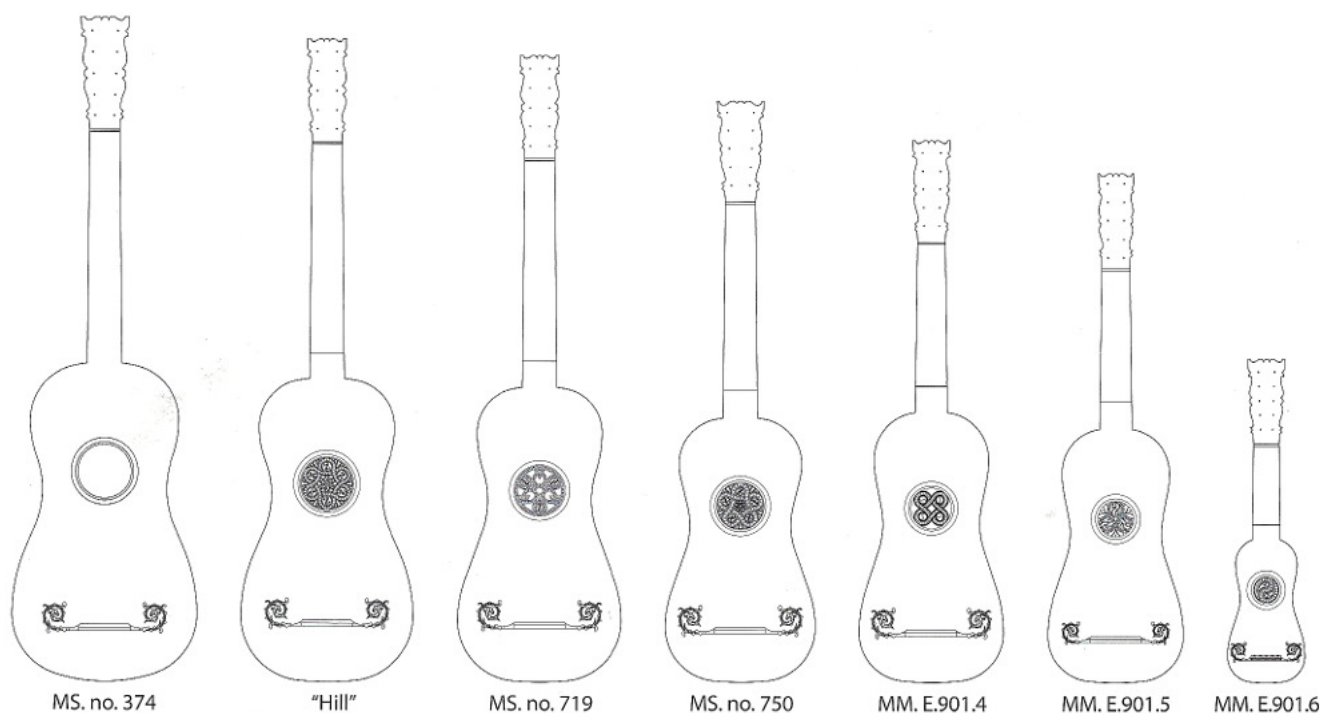


Figure 2. A lineup of the Stradivari guitars.

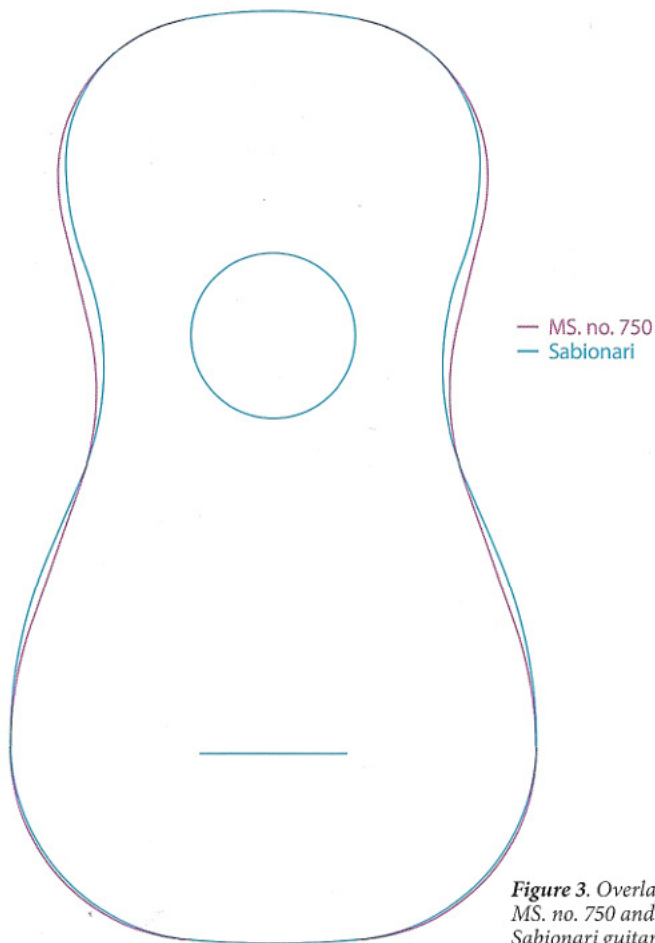


Figure 3. Overlay of MS. no. 750 and the Sabionari guitar.

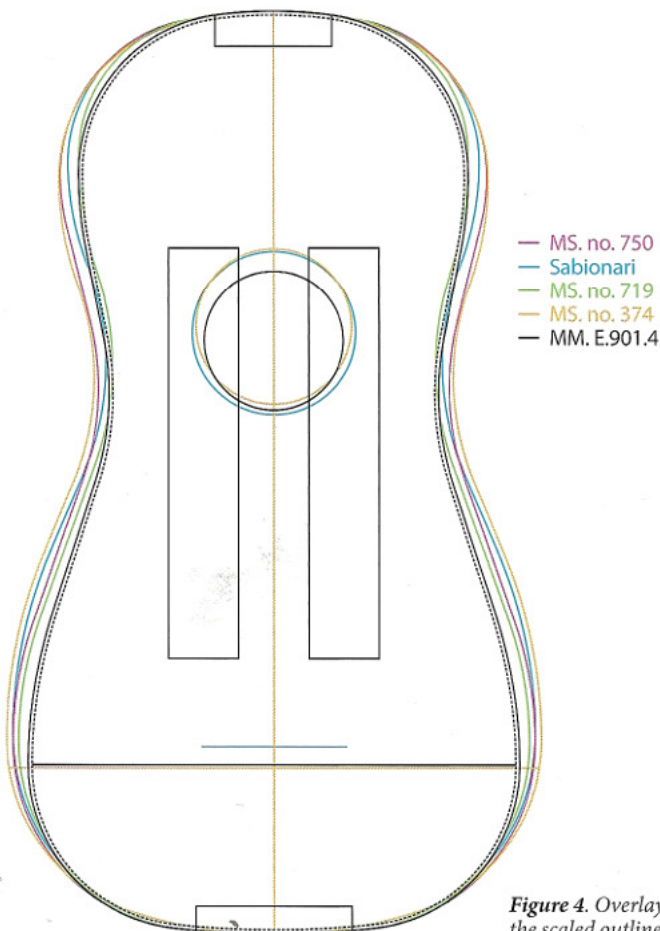


Figure 4. Overlay of the scaled outlines.

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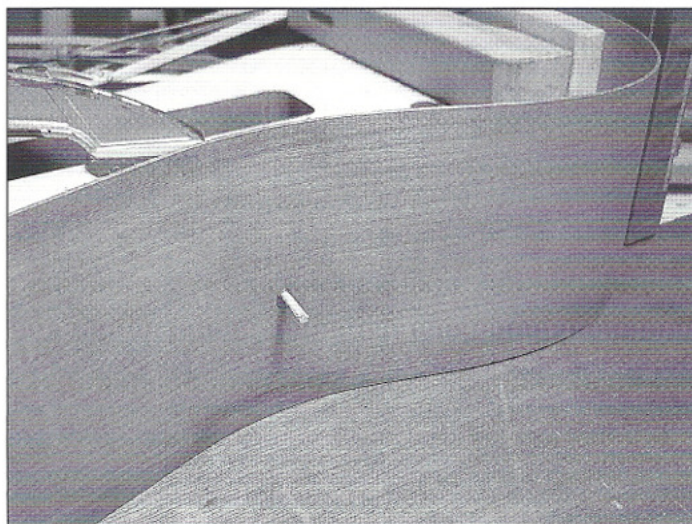
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reinforced by little glue blocks (tentellones) and sometimes pieces of paper or lengths of twine drowned in glue were used as lining.³⁷ The sides were probably bent freehand, without the use of a form. (Most Voboam guitars, for example, are quite asymmetrical and show much variation in dimensions.³⁸) The blocks had enlarged gluing surfaces for the back, like a Spanish foot. Finally, linings were glued to the ribs and the box was closed with a heavy back which served as a backbone to the guitar's structure. This method of construction is quite close to that of some archaic violins.

In the other method, the blocks were attached to an inner form. After the sides were glued to the blocks, the neck was attached with one or more iron nails and the back was put on. Then the form was removed and the glue joints reinforced with strips of paper or parchment. Finally the top and fingerboard were installed. This method is close to that of the lute. (The use of outer forms appears to be a 19th-century fashion.)

The distinction between the two methods is a very rough one, and many overlaps between the two can be found.³⁹ Both the Chambure vihuela and Belchior Dias guitar have a Spanish foot, but were most likely made on an inner form. Something that both confused and amused me over the last couple of years was to discover that a lot of contemporary makers use the "archaic" method to make Stradivari guitars and the "inner form" method to make Voboams.

To me, the use of an inner form is a key element of reconstructing a Stradivari guitar. The original forms were made out of slab-cut walnut or willow, but I've made mine of 18MM MFD, mainly because of its stability and low cost.

The blocks are glued to the recesses at the top and bottom. To make later removal easier, a piece of paper is glued between the blocks and the form. Two plugged holes in the sides of the guitars show that the form was placed about halfway down the neck block. The holes were used to hold the sides to the form during construction. The small Paris form (MM. E.901.6) still has some remnants of these pins, proving it was indeed used to make an instrument.⁴⁰

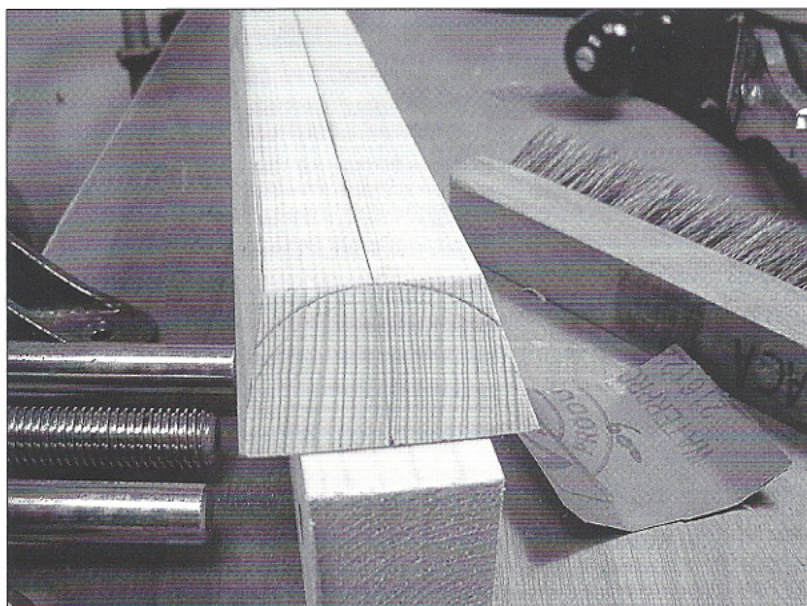
The sides are brought to thickness ($\frac{1}{2}$ punto = 1.68MM), added to the form, and glued to the blocks. The round holes in the small form probably served a double function; to store it to the wall when not in use, and with an inserted dowel, some rope,

and a clamping block, to hold the sides to the block when gluing.⁴¹ The backs and sides were made of maple (Sabionari, Giustiniani, Hill and Rawlings), but the Vuillaume was executed in cypress.

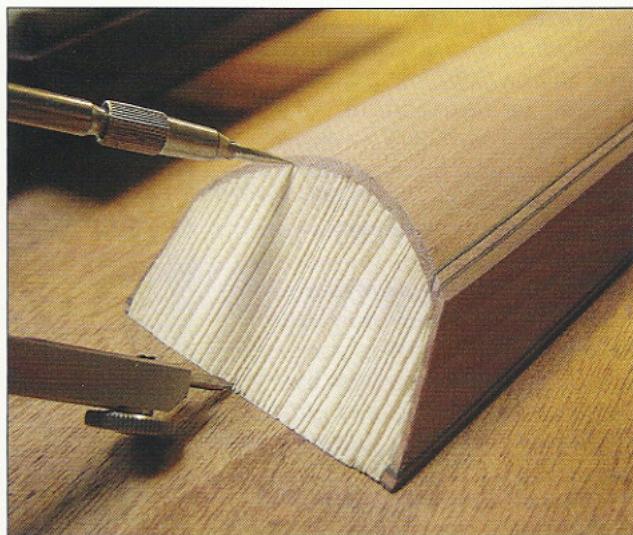
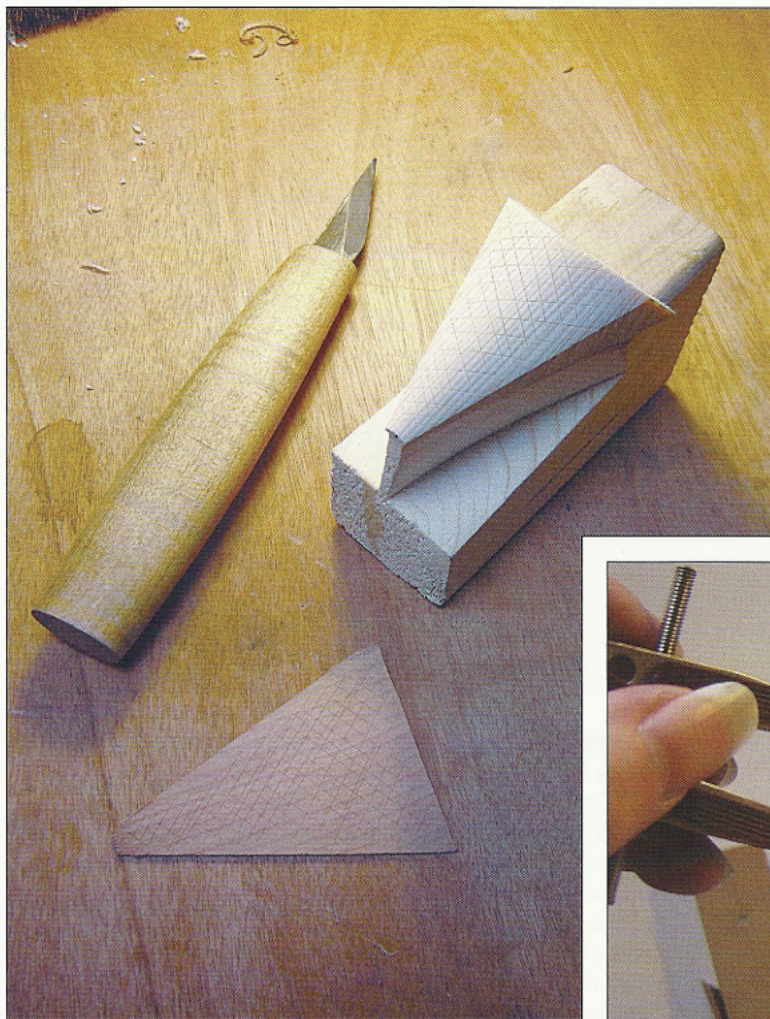
It is uncertain what kind of wood was used for the core of the neck, but it is thought to be poplar. The neck and head of the Rawlings are possibly made of maple, but the authenticity is debated. I used spruce (*Picea abies*), which was the wood of choice for the necks of many guitars and lutes by other 17th-century makers, and its excellent strength-to-weight ratio gives a very light and rigid neck. The necks of the Giustiniani and Hill are veneered with maple, inlaid with b/w/b purfling, quite similar to those used in the edge of violin plates.

The headstock is attached to the neck with a V-joint at a 10° angle. The veneer on both sides of the headstock was not ebony but bog-oak, wood from oak logs that turned black after lying submerged in swamps for centuries. At the back of the head there is an inlaid maple panel with an engraved signature and date, filled up with a black paste:

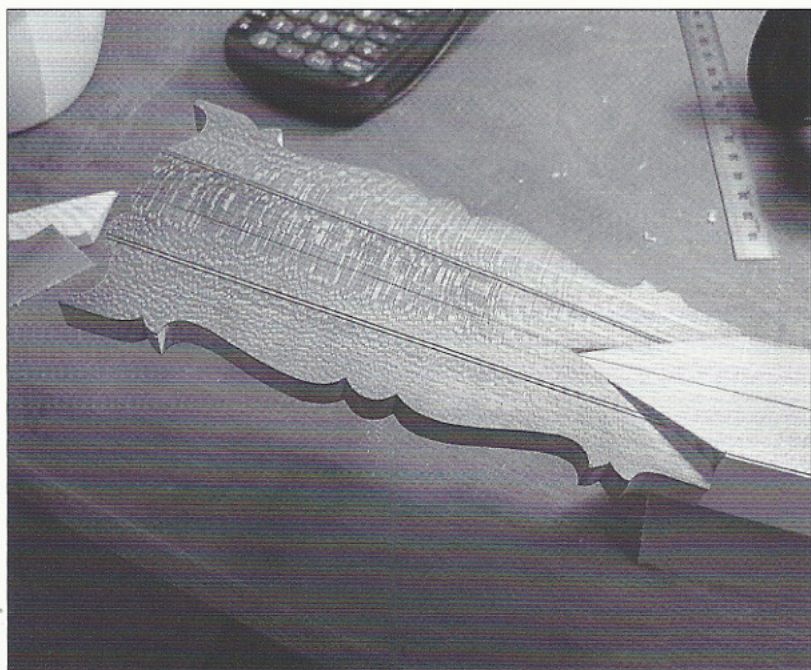
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CREMONEN: S F: 1688



Top left: MDF form with blocks attached. Top right: Little dowels hold the sides to the form. Above: Preparing the spruce core of the neck.



Top left: Veneering the "ice cream cone" heel.
 Top and middle right: Matching the miter of the
 neck and heel. Bottom right: The little neck is
 ready for its peghead to be grafted on.
 Below: The veneered peghead being fitted to the
 rough neck shaft.



The neck is glued to the sides and top block, and originally secured with an iron nail about 7cm long. Both the Sabionari and Hill guitars have three slanted nails (to prevent the block from splitting) going through the top block into the neck.⁴² Originally the necks of violins were attached the same way; the mortised connection is the result of later conversions. Because I couldn't get hold of appropriate nails, I decided to use a screw instead, which had the advantage that the extra grip provided prevented me from a lot of sleepless nights.

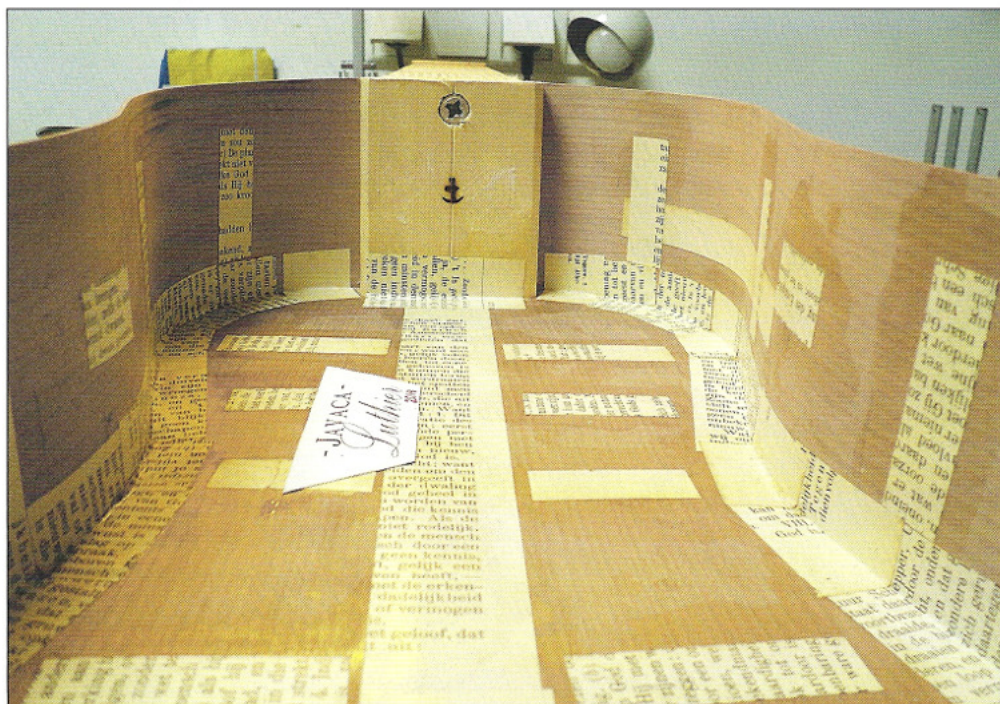
After the neck was attached, the sides were planed down to the desired height. The backs are just flat; the arching of the Rawlings seems to be caused by a later restoration. Backs are approximately 2mm (7 atoms) for the Giustiniani⁴³ or 2.3mm ($\pm \frac{3}{4}$ punto) for the Sabionari.⁴⁴ Leaving such a thin back not supported by any bars seems like asking for trouble, and most modern copies have bars on the back to strengthen it and prevent it from warping. But after it is glued to the sides you will notice the resonance, not choked up by bars.

With the back glued to the sides, the form can be removed. A slight tap with a hammer is enough to separate the blocks from the form. The wooden pins are removed with a pair of pliers and the holes filled up with another dowel.

The glue joint between back and sides is reinforced with strips of handmade paper. Many lutes and guitars of this early period have paper linings. This paper was made from cloth rags and has long fibres that lie scattered throughout the whole sheet. It is stronger and more tear-resistant than modern factory-made paper from wood pulp, which has short fibres and shows a sort of grain-direction. When used, the paper absorbs some water in the glue, causing it to swell lightly. When the glue dries and most of the water evaporates, it shrinks back and tightens the glue joint.

The soundboard of the guitars is made from quartersawn book-matched spruce (*Picea abies*) of the following thicknesses: the Sabionari, 2.3mm;⁴⁵ Giustiniani, approximately 1.6mm $\approx \frac{1}{2}$ punto;⁴⁶ and Hill, 1.5mm.⁴⁷ But we must consider the possibility that the latter two were reglued during later restorations.

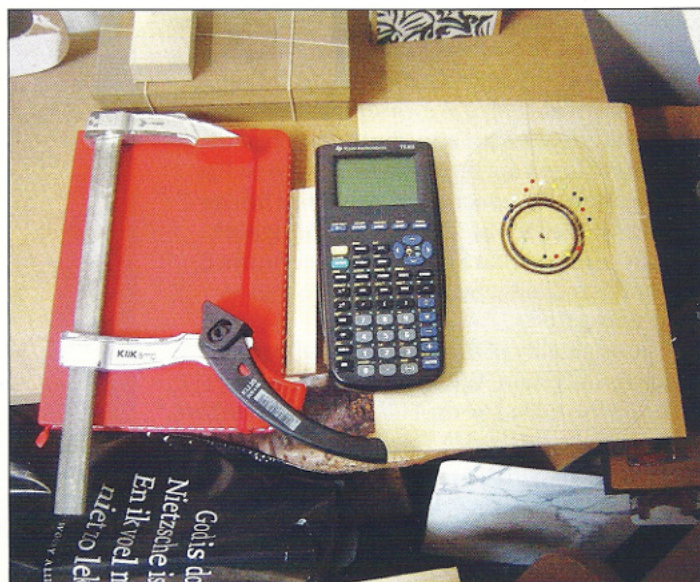
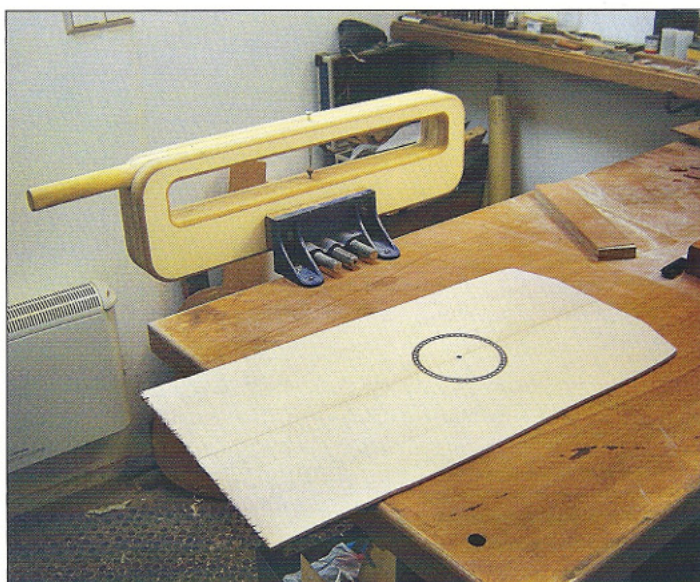
Around the soundhole is an inlaid border, filled with alternating lozenges and squares, or lozenges and disks (Rawlings), between two borders of b/w/b purfling. This reflects the edge inlay of eight violins, a viola and a cello, all by Stradivari, of which the Hellier (1679) and Grefuhle (1709)⁴⁸ are the most famous examples. The graft of the inlay is approximately 3 punti wide and located 1 punto from the edge of the



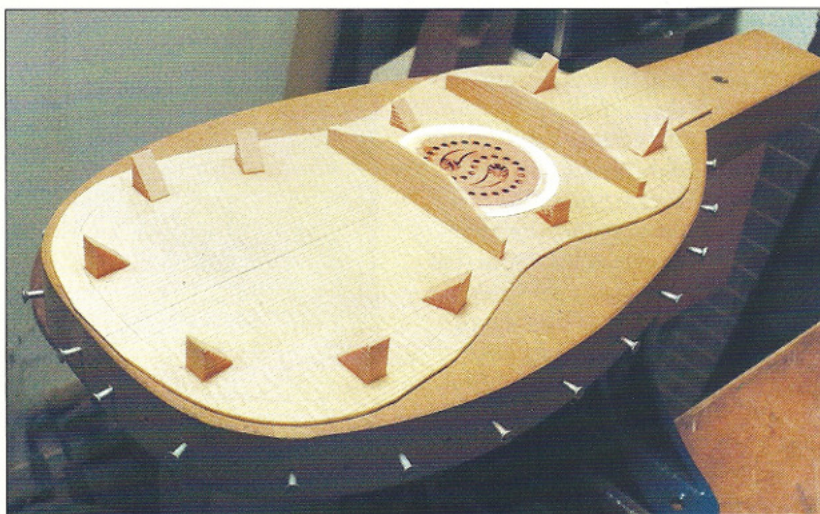
soundhole. The black paste is probably a mixture of bone black and glue⁴⁹, or mastic of powdered ebony.⁵⁰

The bracing of Stradivari is quite enigmatic. The Giustiniani has two bars (one above and one below the soundhole), glued under a 10° angle to the perpendicular line, enlarging the bass side and tightening the treble side of the soundboard. The lower bar of the Hill is slanted, while the upper is perpendicular to the centerline. The bars in the Sabionari are certainly apocryphal,⁵¹ and both the Rawlings and Vuillaume show signs of later alterations. Some consider the slanted bars to be non-original or likely to have been moved. But could the differences in these bracing patterns and gradual change over time be ascribed to Stradivari's experimental nature, which also caused him to make the long-pattern violins in the last decade of the 17th century, before returning to his



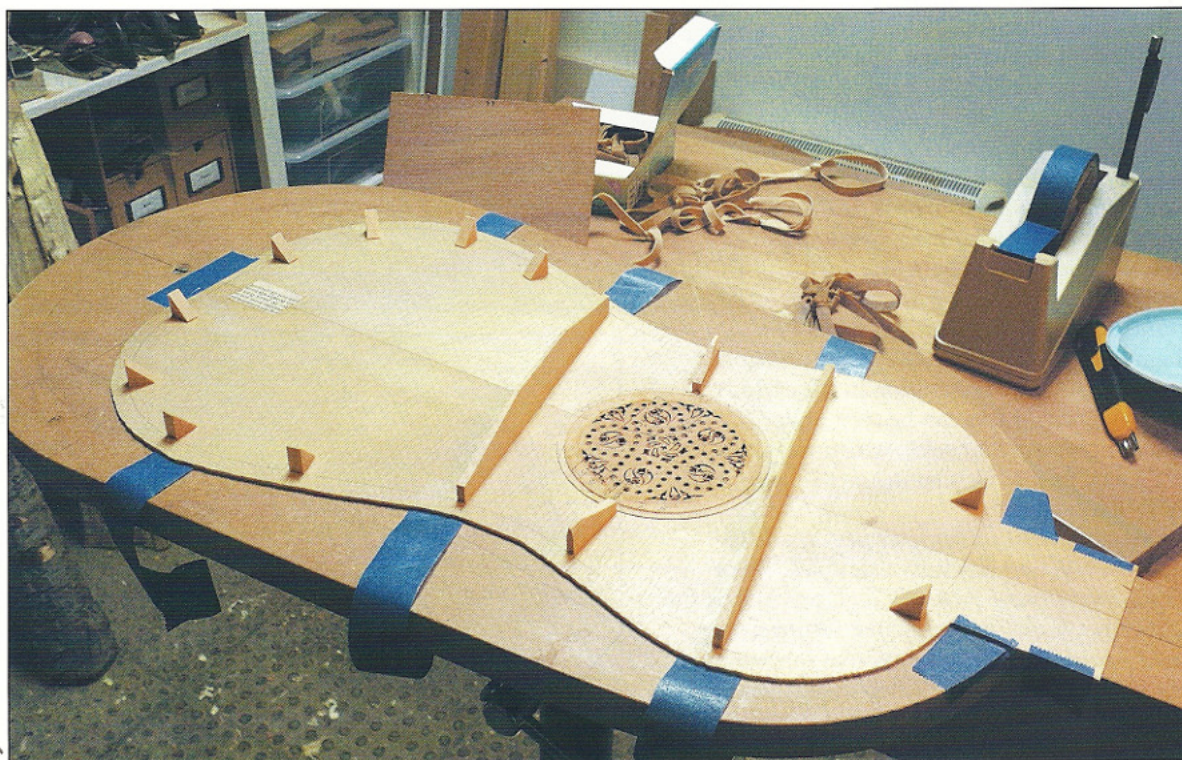


earlier, more Amatese model? And that also led him to flatten and lower the arching of his violins, breaking away from the earlier Cremonese tradition, producing a stronger sound, more valued when, long after his death, the big concert halls came into fashion? Or are these bracing patterns later alterations by restorers and repairmen? None of the surviving guitars has recently been opened to give an answer to this problem and for the integrity of the instruments it is better to leave them this way. Maybe in the future new, non-destructive exploration techniques will help to shine a new light on this subject.



Facing page:
The interiors of the guitars. Note the screws to attach the necks. The instruments have only paper linings. These are cut from a 19th-century book by a preacher who called the great philosopher Spinoza "an unholy Jew." After reading this I didn't feel guilty cutting it up.

This page, top:
Thickening the soundboard. The punching device is my own version of the one used by Stradivari.
Top right:
Gluing the inlay around the soundhole of the little guitar.
Middle and below:
The guitars are braced and the positioning cleats are in place.



Another much-debated subject is the bridges. I like to think of them as a third bar, placed on the outside of the soundboard, to which the strings are tied.

Both the Sabionari and Giustiniani had their bridges replaced during modernizations in the 19th century. An apocryphal rosewood bridge has been added to the Vuillaume. The hypothesis has come up that Stradivari never finished the guitar and left it behind in the workshop after his death.⁵²

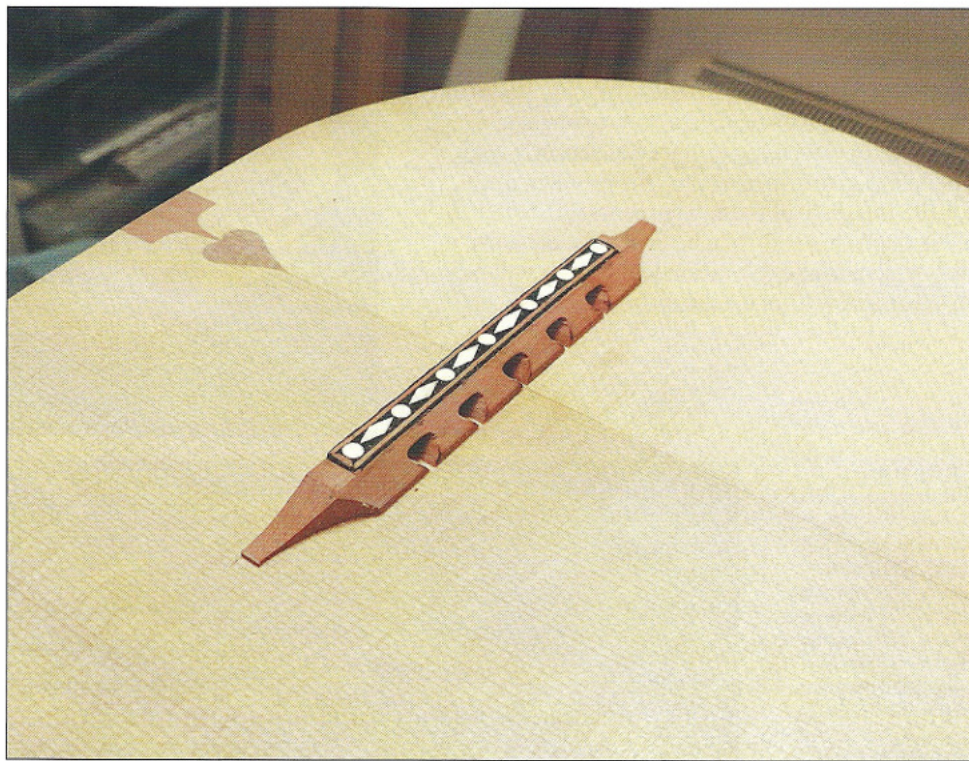
The originality of the Hill and Rawlings bridges is uncertain. While some say they are replacements added by the Hill workshop,⁵³ others consider them original.⁵⁴ This disagreement is caused by the triangular "windows" used to attach the strings. Besides these two Stradivari guitars, there are a few examples by the Voboam family,⁵⁵ but the Guadalupe,⁵⁶ Chambure,⁵⁷ and Quito⁵⁸ vihuelas all have a "window" bridge or show signs of having been equipped with one. The models for lute and mandolin bridges in the Museo Stradivariano all have conventional drilled holes through them.⁵⁹

I agree with the Sinier de Ridder workshop and think the Hill and Rawlings bridges are probably original, considering that the inlay on top of the bridge is similar to that around the soundhole. The Hills would probably have chosen more "noble" materials like ebony and ivory to replace a bridge on a guitar by Stradivari, like they did with the edge purfling on the 1688 guitar.⁶⁰

About the triangular holes: they are a perfect compromise, allowing the string pairs to be adjusted, while the contact surface with the soundboard is maximized. Again, could this be ascribed to Stradivari's experimental nature?

The bridges were probably made of pear, a dense and light wood, very suitable for this purpose, and frequently found on guitars and lutes from this period. On both sides of the bridge two "moustaches" were found, but only the Giustiniani has them intact. On the Hill they were probably removed during a restoration in the early 20th century. Some traces can be seen under UV light. Their form and color, which was the same as the bridge, can be seen in an 1888 watercolor by William Gibb.⁶¹

Most modern copies have pegs modelled after the Hill and Rawlings examples. These pegs however were probably replacements by the Hills. They look very much like 18th-century cittern pegs. For the restoration of the Sabionari, the Sinier de Ridder workshop made their pegs after one example that was handed down with the guitar. I decided to make mine after some

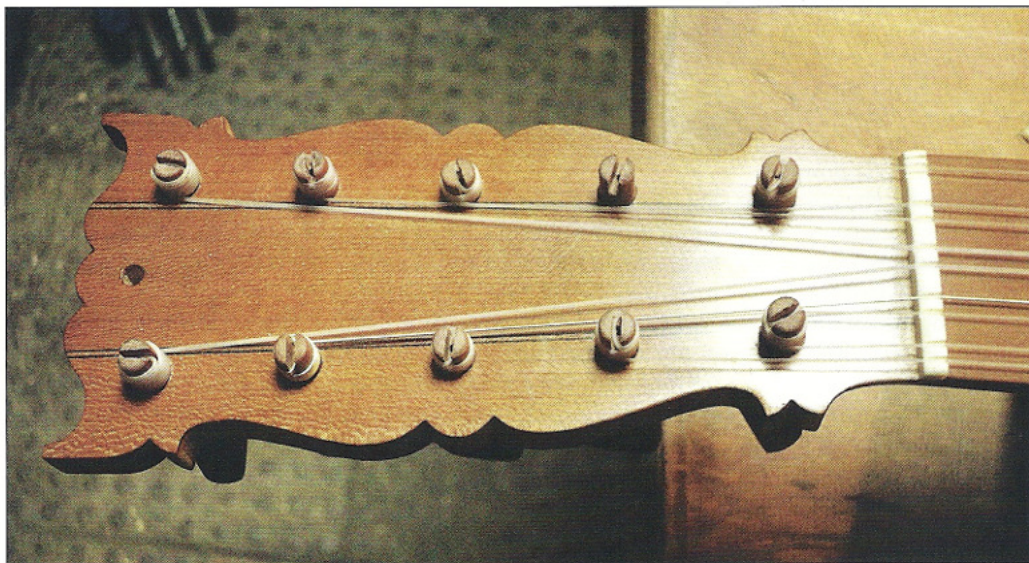


pictures I made from the Vuillaume guitar. These pegs look a bit rough, but I think they are more authentic than the Hill pegs.

As with other Baroque guitars, the soundhole of Stradivari's guitars was closed up with a rosette. Only three of the five guitars survive with rosettes, and the originality of these is in doubt.⁶² One argument used to disqualify the roses in Stradivari's guitars is the assumption that Baroque guitars only had deep, 3D rosettes, like inverted wedding cakes, and flat roses were intended for harpsichords. There is evidence that this was not the case. Two paintings by the Dutch Caravaggist artist Gerard van Honthorst, both depicting a woman holding a guitar, show instruments with flat rosettes.⁶³ A couple of Baroque guitars with flat roses by Christoph Koch (c. 1650),⁶⁴ ascribed to Matteo Sellas,⁶⁵ and Bertet (Paris, 1766)⁶⁶ survive. Also there is at least one Voboam guitar with a flat rose.⁶⁷

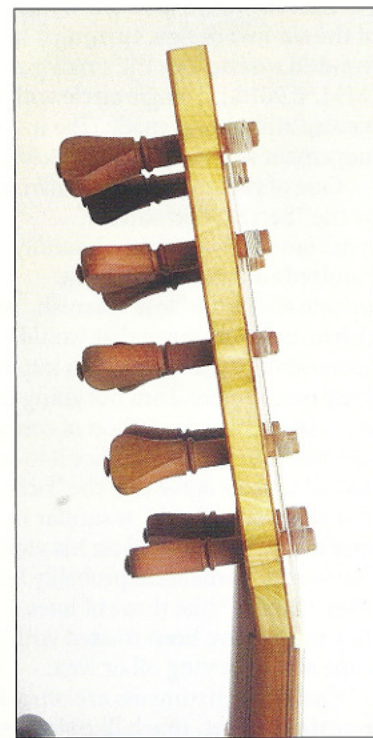
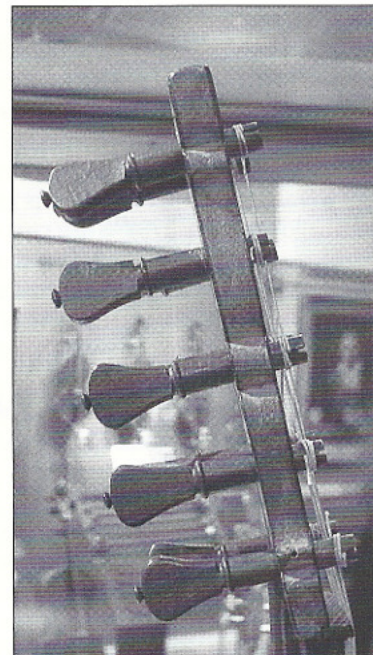
The rosettes of the Sabionari and Giustiniani are missing, but the one in the Hill is in pristine condition, with a beautiful six-fold design. There are clues that the rosette of the Rawlings guitar, with its Gothic design, is a replacement by the Hill firm.⁶⁸ The Vuillaume rosette was heavily damaged, but its general design is still there.

The rosette of the Hill guitar finds its counterpart in the earlier-mentioned Canobio-Pagliari ("Revisto e coretto"). Both roses show strong similarities, but also slight differences in design.⁶⁹ Reportedly there is also an anonymous guitar in the Museo degli Strumenti Musicali in Rome,⁷⁰ but I wasn't able to find a photograph to compare. The remnants of the rose in the Vuillaume bears a close resemblance to the design of a rose in the Queen-Elizabeth virginal, made by Giovanni Baffo (Venice, 1594), now kept in the Victoria & Albert Museum in



Facing page, top: Making moustaches. Middle: The "window" bridge with its triangular holes. Bottom: A peg made after the Vuillaume example.

This page, above right: The Vuillaume peghead. Others: Reconstruction by the author. On the back of the peghead the signature "ALUM: S STRADIVARIUS JAVACA: F: 2014" is a little wink to Stradivarius who put a label in his first violin (1666) bearing the statement that he was an "Alumnus" (student) of Nicolai Amati. There is no evidence that he was. Perhaps he did it because Amati was Cremona's leading violin maker at that time.



London.⁷¹ Another rose that shows similarities to the design of the roses in Stradivari's guitars is found in a bandurria made in the second half of the 18th century by Joseph Massagué in Barcelona.⁷²

Besides the differences, there are a lot of similarities between the rosettes in Stradivari's guitars. A feature all these rosettes have in common is the ribbon of pierced holes, forming a sort of knot, giving the whole design a sort of moving appearance. Even if they are not original, were they perhaps made and/or (re-)placed by the same person? And when during the last 300 years would that have been done?

Another question that needs further investigation is whether the historical masters made the roses themselves or bought them from an external supplier, like many modern-day makers do. This would also give more insight into the similarities between the rosettes of otherwise independent makers.

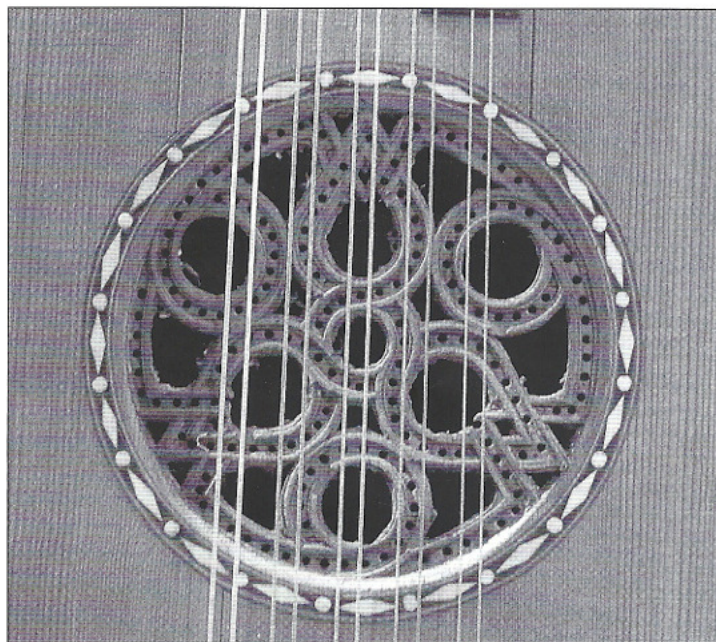
I think the rosettes of the Hill, Vuillaume, and Canobio-Pagliari were indeed placed by Stradivari. Or that the Canobio-Pagliari rosette was at least an inspiration for the later Hill rosette.

Recently, Boston-based violin maker Kevin Kelly pointed out to me that the scratch marks in a template for the corners of a cello (MS. no. 275)⁷³ are a part of the same pattern of the Vuillaume rosette. Perhaps it was used as a backing when the rose was carved and later repurposed as cello pattern? It gives us a clue about the carving of roses by Stradivari, and also makes another connection between the Paris guitar and his workshop.⁷⁴

Rather than buying one, I cut all roses for my instruments myself. I don't disapprove of external suppliers, but it appeals more to my own style of working. Because there are no designs for smaller rosettes for the other guitars left behind by Stradivari, I decided to make an educated guess and design them myself, following the same style and fashion. For MS. no. 750, I took one circle out of the six-fold design, turning it in a five-fold rosette. For the small guitar (MM. E.901.6), a single circle with the pierced ribbon was made. The final judgement is up to your own taste.

One of the subjects most affected by the "Secret of Stradivari" syndrome is the varnish. Literally hundreds of books have been written about his "lost" varnish, an alchemistic substance that would turn even the cheapest violin into a sonic masterpiece. I am not going to speculate about his method of cooking and applying varnish. Suffice it to say that all sources agree that the "rich, orange-colored finish" is similar in appearance to that used on his violins. The soundboards were probably left unvarnished;⁷⁵ like those of lutes, they might have been treated with some sort of drying oil or wax.

Cases of instruments are often lost over time. Cases, much like strings,



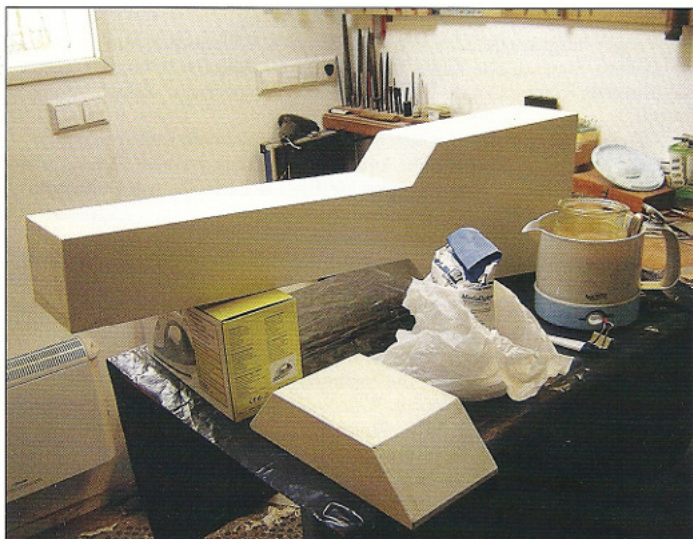
are used until they are worn out and thrown away. A relatively small number survive, often neglected by the general public. They ended up in the attics and depots of the museums that display the instruments they used to protect.

Luckily, the Giustiniani still has its case. It is made of strips of poplar, held together with iron nails and glue. The outside is painted with red and black tempera over a gesso base, a mix of chalk and animal glue. A double-headed eagle decorates the belly. The case opens at the bottom. The interior, which would touch



the guitar, is lined with block-printed paper, depicting flowers and birds, quite crudely colored in blue, red, and purple. The name and address of the paper maker or retailer are visible on the sides. This paper is similar in fashion to the paper lining in the case belonging to the Charles Beare mandolin.⁷⁶

Along with the reconstruction of the two guitars (MS. no. 750 and MM. E.901.6), I made two cases, using the same design and techniques. Although they appear quite



Facing page, top: The Vuillaume rose.
Bottom: The author's five-fold adaptation of the "Hill" rose.

This page, top left: The wooden case strengthened with linen cloth and gesso (hide glue with gypsum) as a base coat. Top right: The case for the little one, made from an old pine wine case. Middle right: The inside of the case is covered with block-printed paper. Below: The big and little guitars with their cases. The little one was nicknamed "Il Canino" (the puppy) in reference to an inscription Stradivari left on a pochette pattern: "è la misura del canino" (this is the measure of the puppy). This little whim made researchers believe that he took some delight in making these little instruments. The dog was found on a 17th-century Italian pistol, kept in the Rijksmuseum, Amsterdam.



fragile at first sight, they have proven to be very strong and do a great job protecting the guitar. They have no handle and I suspect they were primarily used to store the guitar at home, just like the Italian harpsichord cases.

In conclusion: The guitars made by Antonio Stradivari are fine examples of his craftsmanship. The instruments were built lightly and quite resonant, while decoration was kept to a minimum. They show that their maker, beside his wonderful violins, also had an eye for something as common as a guitar.

Along with the surviving guitars, the forms and patterns are a great source of information which is often neglected by both makers and most scholars. I sincerely hope that in the future more information about Stradivari's guitars and forms will be made available and accessible for study. An online database would be very nice. This would help to demystify and allow more insight into the ways Stradivari and his contemporaries made their instruments, rather than guessing and fueling the idea of a "Lost Secret." It might rob us of some myths. But what is lost in legends will be made up by bringing wonderful old knowledge and music back to life. In that way, this little article is not the end of a journey, but just the beginning! —

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